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PATHOLOGICAL AND SURGICAL OBSERVATIONS

ON THE

DISEASES OF THE EAR.

By JOSEPH TOYNBEE, Esq.,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS, LONDON; AND LATE
ASSISTANT TO THE CONSERVATORS OF THE MUSEUM
OF THAT INSTITUTION.

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MEMBER OF THE ROYAL COLLEGE OF SURGEONS, LONDON; AND LATE
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COMMUNICATED BY RICHARD BRIGHT, M.D.

READ JUNE 22ND, 1841.

Introduction.

I PROPOSE to lay before this Society a series of papers, having for their object the elucidation of the Nature and Treatment of the Diseases of the Ear. In introducing my first communication upon this branch of surgery, I am bound to confess that the investigation of it is attended with more difficulties than are met with, I think, in the study of any other class of diseases. Those difficulties, however, which formerly appeared to be most formidable, have been much diminished by the exercise of careful and patient attention, and I feel assured that the continued study of this branch of surgery, will be productive of still more satisfactory results.

If a more accurate acquaintance with the true nature of the diseases of the ear should not immediately lead to the discovery of new curative means, it must assuredly indicate plans for the prevention of deafness ; it will point out the course to be adopted in order to arrest its progress, and it will guide us in the adoption of a rational and scientific method of treatment.

With respect to my own labours in this department of surgery, were it only for the many phenomena worthy of consideration which they have made me acquainted with, I should be determined not to relinquish them ; but the cheering confidence that they will be productive of practical benefit, encourages me to pursue them with perseverance and ardour.

I intend, at first, to confine myself to investigations into the pathology of the organ of hearing, as I am convinced, that without a knowledge of this, it will be impossible to arrive at any rational and useful plan of treatment for its diseases.

1. *Of the cavity of the tympanum.*

From the opportunities I have had during the late few years of examining with care the cases of persons afflicted with deafness, I have been led to believe that this disease must very frequently depend upon a morbid condition of the fibro-mucous membrane lining the cavity of the tympanum. I have arrived at this conclusion from studying the history of the cases that came under my observa-

tion, and from a careful examination of the condition of the ear by aid of the speculum auris, &c., and I have been confirmed in this opinion, by the results of the curative treatment which I have adopted. In order to throw some light upon this subject, I determined to examine the condition of the tympanic cavity in all the ears that I could obtain.

I was incited to this resolution by the perusal of the observations on the Diseases of the Nerves of the Senses, by Mr. Swan, contained in his valuable “Treatise on Diseases and Injuries of the Nerves.”* Mr. Swan relates the particulars of three dissections† in which the mucous membrane of the cavity of the tympanum was diseased and thickened, so that the nervous plexus of Jacobson could not be distinguished. One of these cases occurred in an old woman, the second in a man, and the third in a very young woman. In the second case there was also some roughness of the bone.‡ After detailing these appearances Mr. Swan writes,§ “I believe deafness does not so often depend on a disease of the auditory nerve as has been supposed, but much more frequently on an inflammatory action attacking the membrane lining the tympanum, and involving the small branches of the tympanine nerves.” He adds, “although

* New edition, very considerably enlarged, 1834.

† Page 270.

‡ I am indebted to Mr. Swan for a specimen of this kind.

§ Page 271.

many of the noises may depend on the disordered functions of the auditory nerve, I think they may arise too from these small branches of the glosso-pharyngeal and their communication with the sympathetic in the carotic canal."

The following observations by the same author appear to me to be of the greatest interest. "The consideration of the distribution of the tympanine branch of the glosso-pharyngeal nerve, leads to the conclusion that the tympanum performs more important functions in the production of hearing than have been usually ascribed to it, and that the failure of remedies in cases of deafness which have been termed nervous, may have proceeded very much, not only from the obscure situation of the tympanum, but from the misapplication of the remedies themselves. And I conceive, therefore, as a thickening of the membrane lining the tympanum and involving such delicate nerves, can be so often observed, that many diseases of the ear may be more within the reach of art than has been contemplated, and that by subduing the inflammatory action at its very onset, before the structure of the delicate parts has become so much changed as permanently to impair their functions, many of the worst cases might be prevented."*

I now proceed to detail at length the account of the dissections of forty-one ears ; which were all taken, with one exception, from patients who died

* Loc. cit. pp. 272, 273.

in hospitals and infirmaries of various diseases ; and as a general rule they came into my possession, unaccompanied by any particulars respecting the patients during life.

DISSECTIONS.

Nos. I. and II. From an adult.

The right ear.—The external meatus is in a healthy state.

The membrane of the tympanum is very delicate, and quite transparent, so that the handle of the malleus is distinctly seen through it.

The cavity of the tympanum contains but a very small quantity of mucus, which is spread over the surface of the investing fibro-mucous membrane. The latter membrane is so extremely thin and transparent, that its presence upon the surface of the osseous walls of the tympanum cannot be detected without the use of a magnifying glass, and by the aid of the touch. The nervous filaments upon the surface of the promontory are most distinctly seen ; the margin of the fenestra rotunda is distinct and defined, and the membrane which closes it is thin and transparent. The ossicula at first sight do not appear to be covered by any membrane. The crura of the stapes and their point of attachment to its base are seen distinctly, and between the inferior surface of these crura and the promontory is seen a distinct fissure.

The left ear presents the same appearances as the right.

No. III. From a man æt. 45.

The right ear.—The meatus externus is healthy.

The membrana tympani is thin and transparent.

The cavity of the tympanum is in a healthy condition; the mucous membrane which invests it is thin and nearly transparent, so that the tympanic plexus of nerves is easily distinguished. This membrane forms an investment to the stapes, which prevents its crura from being distinctly seen.

No. IV. From an adult.

The right ear.—The meatus externus and the membrana tympani are healthy. The mucous membrane of the cavity of the tympanum is nearly transparent.

No. V. From an adult.

The left ear.—The meatus externus, the membrana tympani, and the cavity of the tympanum, are in a healthy condition.

No. VI. From an adult.

Right ear.—The meatus externus, the membrana tympani, and the cavity of the tympanum, are in a healthy condition.

No. VII. From a child.

The same as No. VI. The mucous membrane of the tympanic cavity is quite transparent.

Nos. VIII. and IX. From an adult.

The right ear is quite healthy, and similar to Nos. I. and II.

The left ear is also in a healthy state. The membrane of the cavity of the tympanum is so thin, that the crura and base of the stapes, and the cir-

cumference of the fenestra ovalis, are distinctly seen.

Nos. X. and XI. From a child of eight or nine years of age.

Right ear.—The meatus externus is in a healthy state.

The membrana tympani.—Excepting a small transparent portion of about a line in diameter, situated at the point of attachment of the long process of the malleus, this structure is like white paper.

The cavity of the tympanum is nearly filled by a viscid mucus of a dark brown colour, which also occupies the cavity of the mastoid cells. Upon examination with the microscope, this fluid presents numerous elongated epithelial cells, several of which are in marginal apposition, also corpuscles similar to those of the blood, and others of a darker colour, and larger, which are apparently composed of granules, and contain a nucleus and nucleolus. The Eustachian tube contains a large quantity of this mucous fluid. In the midst of this fluid are smaller masses of a whitish calcareous substance, possessing considerable hardness; these are held together by means of concreted mucus. The membrane lining the cavity of the tympanum, the mastoidal cells and the Eustachian tube is thicker than natural, opaque and white. The ossicula auditus receive a thick investment from it, and the base of the stapes is quite concealed by it. The tympanic plexus of nerves is not discernible through this thickened membrane.

The left ear.—The meatus externus contains a quantity of coagulated fluid which is in contact with the membrana tympani.

The membrana tympani.—The cavity of the tympanum and the Eustachian tube are in a similar state to those of the right ear.

No. XII. From an adult.

The membrana tympani is healthy.

The mucous membrane of the tympanic cavity is somewhat opaque.

No. XIII. From an adult.

The membrana tympani is healthy.

The mucous membrane of the tympanic cavity is thin and transparent, excepting where it covers the stapes, which it nearly conceals, being opaque and flocculent.

No. XIV. From an adult.

The membrana tympani is thin and transparent.

The cavity of the tympanum.—Its investing membrane is thicker than natural, entirely concealing the stapes ; and membranous bands connect the long process of the incus to the wall of the tympanum. The opacity of the investing membrane of the tympanum prevents the nervous plexus from being discerned.

No. XV. From an adult.

The membrana tympani is rather opaque.

The mucous membrane of the tympanic cavity is thin and transparent ; the circumference of the fenestra ovalis, the crura of the stapes and its base are distinctly seen ; fine membranous bands pass from

the anterior crus of the stapes to the wall of the tympanum.

No. XVI. From an adult.

The left ear.—The meatus externus contains a considerable quantity of cerumen mixed with epithelium.

The membrana tympani is not quite so transparent as natural.

The cavity of the tympanum.—The mucous membrane is somewhat opaque, and a membranous band connects the neck of the stapes to the membrana tympani.

Nos. XVII. and XVIII. From a child.

In both ears the meatus externus and the membrana tympani are healthy.

The mucous membrane of both tympanic cavities is thin and transparent, and the lower margin of the fenestra ovalis is distinctly seen ; there are delicate bands connecting the upper surface of the crura of the stapes to the surrounding mucous membrane.

No. XIX. From a man æt. twenty-seven, who died of consumption, with a disease of the bone of the right ear.

The left ear.—The membrana tympani has been removed.

The cavity of the tympanum.—Its investing membrane is thin and very delicate : a delicate, firm membranous thread connects the upper surface of the posterior crus of the stapes with the superior wall of the tympanic cavity. The stapes however seems to possess its natural mobility.

Nos. XX. and XXI. From a child.

The right ear.—The meatus externus is healthy.

The membrana tympani is transparent, and in a healthy condition, with the exception of a narrow opaque band at its circumference.

The cavity of the tympanum contains a small quantity of transparent mucus ; its lining membrane is rather opaque ; the larger nerves can however be distinguished through it. The ossicula are smooth, so that they do not appear to have any membranous investment ; membranous bands pass from the upper surface of the posterior crus of the stapes, and from the upper and lower surfaces of its anterior crus, and connect this bone to the adjoining mucous membrane.

The left ear is in a healthy condition, excepting the presence of some membranous bands, which pass from the surface of the ossicula auditus to the surrounding mucous membrane.

Nos. XXII. and XXIII. From an adult.

The right ear.—The meatus externus and the membrana tympani are in a healthy condition.

The cavity of the tympanum.—The mucous membrane is thin and transparent ; there are no adhesions in any part of it, and the stapes appears to be more easily moved than in the specimens in which it is almost concealed by the thick mucous membrane.

The left ear.—The meatus externus and the membrana tympani are healthy.

The cavity of the tympanum.—The mucous membrane is rather thicker than natural, and is somewhat

opaque. Delicate bands connect the posterior part of the long process of the incus to the mastoidal cells, and the upper surface of the stapes to the superior wall of the tympanic cavity.

Nos. XXIV. and XXV. From an adult.

The right ear.—The meatus externus contains a mass of cerumen in contact with the membrana tympani, which is somewhat opaque.

The cavity of the tympanum.—Its investing membrane is slightly opaque, and there are membranous bands between the crura of the stapes and the adjoining walls of the tympanum.

The left ear is in the same state as the right.

No. XXVI. From an adult.

The right ear.—The meatus externus and the membrana tympani are healthy.

The cavity of the tympanum.—The fibro-mucous membrane is slightly more opaque than natural, and bands connect the crura of the stapes to the circumference of the cavity of the tympanum.

No. XXVII. From an adult.

The right ear.—The meatus externus and the membrana tympani are in a healthy condition: in the floor of the former, near to the membrana tympani, a rye seed is lodged.

The cavity of the tympanum.—Its mucous membrane is somewhat opaque, and is covered by a considerable stratum of mucus, a quantity of which blocks up the Eustachian tube. Delicate membranous bands connect the crura of the stapes to the walls of the tympanum.

Nos. XXVIII. and XXIX. From a man, æt. 36, who died of consumption.

The right ear.—A quantity of ceruminous secretion fills the whole of the meatus externus.

The membrana tympani is healthy.

The Eustachian tube, at its guttural extremity, contains a quantity of viscid mucus.

The cavity of the tympanum is lined by a thin layer of mucus. Its investing membrane is rather thicker than natural; the crura of the stapes are, however, seen very distinctly. Extending from the long process of the malleus directly inwards to the mucous membrane covering the promontory, is a flat and transparent band of considerable strength.

The left ear.—The mucous membrane of the tympanic cavity is slightly thicker than natural.

No. XXX. From an adult.

The right ear.—The meatus externus and the membrana tympani are in a healthy state.

The cavity of the tympanum is covered by a small quantity of mucus; its investing membrane is somewhat thicker than natural, and rather opaque, so that the principal trunks only of the tympanic nerves are discernible: delicate bands connect the upper surface of the crura of the stapes to the surrounding mucous membrane, and its inferior surface is scarcely discernible on account of the thickened condition of the membrane which covers it.

Nos. XXXI. and XXXII. From an adult.

The right ear.—The external meatus is healthy;

the membrana tympani is also healthy, being thin and transparent in every part.

The cavity of the tympanum.—Its investing membrane is very slightly more opaque than natural. A firm band connects the long process of the incus with the inner surface of the membrana tympani, and there are also five membranous bands which connect the posterior crus of the stapes to the adjoining surface of the tympanic cavity.

The left ear.—The meatus externus, and the membrana tympani, are healthy.

The cavity of the tympanum contains a small quantity of viscid mucus; its lining membrane is slightly thicker than natural, and delicate bands pass from the upper surface of the crura of the stapes to the adjacent parietes of the tympanum.

The Eustachian tube is filled with thick and viscid mucus, and its mucous membrane is slightly rough.

No. XXXIII. From a young man.

The left ear.—The meatus externus contains a collection of cerumen mixed with epithelium.

The membrana tympani is thicker than natural, and is of a brownish colour.

The cavity of the tympanum contains a considerable quantity of a thick opaque fluid, which is seen by the aid of the microscope to be composed of pus-corpuscles, among which oil globules float. The mucous membrane is white, pulpy, and thick; membranous bands connect the inner surface of the membrana tympani to the malleus. The mucous

membrane of the Eustachian tube is thicker than natural; at its tympanic extremity it contains the purulent fluid above noticed. At about three-quarters of an inch from the point where it opens into the cavity of the tympanum, bands are seen to pass from the opposite parts of its circumference, which are of considerable strength, but do not completely close the canal.

Nos. XXXIV. and XXXV. From an adult, who died of delirium tremens, and who was not known to be deaf by his attendants.

The right ear.—The meatus externus is covered with a thick discharge, of a leaden hue, and having a foetid odour.

The membrana tympani has been entirely destroyed, excepting a very small portion at the upper part of the meatus, to which the processus brevis mallei is attached.

The cavity of the tympanum.—Its mucous membrane is white, thick, and soft; it is covered by a purulent discharge, but without any adhesion.

The left ear.—The meatus externus and the membrana tympani appear perfectly healthy.

The cavity of the tympanum.—Its investing membrane is somewhat more thick and opaque than is natural, and numerous membranous bands are seen to pass from the upper surface of the crura of the stapes to the adjoining wall of the tympanum.

Nos. XXXVI. and XXXVII. From a man, æt. 50.

The right ear.—The meatus externus and the membrana tympani had been accidentally removed.

The cavity of the tympanum.—The lining membrane is thick, and of a dull white hue, and it is soft and velvety to the touch. The nervous plexus on the promontory cannot be distinguished through it. The portion of it which is inflected into the mastoid cells is very distinct, and can be removed from the bone with facility. Where this membrane is reflected over the stapes, it is so thickened, that only the cervix of this bone can be discerned, and from that portion which covers the upper surface of it, several delicate bands are seen to pass to, and to connect it with, the surrounding mucous membrane. The inferior surface of the crura is not visible, as the membrane here passes from the promontory directly to the neck of the bone, and thus fills up the fissure which, in the healthy state, exists between the stapes and the promontory, and the presence of which has been indicated in various dissections, especially in No. I. This membrane can be removed from the surface of the promontory in a distinct layer; it does not adhere to the bone very firmly. The fenestra rotunda is covered by this thick membrane, so that, instead of its having the appearance of a defined foramen, it presents that of a simple depression in the mucous membrane.

The left ear.—The meatus has been removed.

The membrana tympani.—The lower part only of this membrane remains. At its circumference, it is

white, like paper, and, upon a careful examination, this opacity is seen to arise from a thickened state of the mucous membrane of the tympanic cavity, which forms an internal layer to the “membrana tympani propria.”

The cavity of the tympanum.—As in the right ear, the investing membrane is of a dull white colour, and that part of it which is reflected over the crura of the stapes is connected to the surrounding membrane by numerous membranous bands.

Nos. XXXVIII. and XXXIX. From a child who died with a fracture of the cranium.

The right ear.—The external meatus contains a quantity of yellow cerumen, mixed with flakes of epithelium.

The membrana tympani is opaque towards its circumference, and its central portion is of a darkish brown colour.* The opacity of the circumference appears to depend upon a thickening of its internal fibro-mucous lamina. From the external surface of the membrana tympani, and immediately at the point of attachment of the extremity of the long process of the malleus, is a soft, white, polypoid excrescence, of which the pedicle is about half a line in length ; it is flat and narrow, its expanded portion measuring about a line and a half in circumference ; and it is very firmly attached to the membrana tympani.

* This colour was afterwards found to depend upon the presence of blood in the cavity of the tympanum.

The cavity of the tympanum contains a quantity of mucus mixed with blood, the presence of which was discerned through the membrana tympani. The mucous membrane of this cavity is thick and white : membranous bands, and some of very considerable size, pass from the walls of the mastoidal cells, and surround the head of the malleus and the body of the incus ; two other adhesions connect the upper and lower borders of the anterior crus of the stapes to the adjoining parietes of the tympanum ; and a third band connects the external surface of the long process of the incus, near to its inferior extremity, to the membrana tympani, immediately above and below the point where the surface of the latter is traversed by the chorda tympani nerve. Among the thick mucus contained in this cavity are small rounded yellow masses of a caseous consistence ; which, upon examination with the microscope, were observed to consist of minute granules.

The left ear.—The external meatus is full of cerumen and epithelium.

The membrana tympani is transparent at the posterior part of its circumference, but more centrally it appears of a brown colour, which was found to depend upon the presence of a dark fluid in the tympanic cavity.

The tympanic cavity contains a large quantity of thick dark-coloured mucus, among which are portions of the yellow matter noticed in the above dissection. This mucus at the tympanic portion of the

Eustachian tube is of nearly a solid consistence, and completely closes the orifice. The investing membrane of this cavity is thick and white.

Nos. XL. and XLI. From Mr. M. a deaf patient.

The right ear.—The meatus externus is white, and deprived of cerumen. The membrana tympani is transparent, thin and healthy.

The cavity of the tympanum.—Its investing membrane is thin, and appears to be healthy. But a remarkable pathological condition is presented in the firm ankylosis of the base of the stapes to the margin of the fenestra ovalis. This appears to be produced by an expansion of the base of the stapes, which projects into the cavity of the vestibule, so as to form within it an oval protuberance, which is smooth, and of an opaque white, and firmly adherent to the vestibular parietes. This ankylosis appears to depend upon a disease of the stapes, the walls of the vestibule being perfectly healthy. They may be distinguished from each other by the difference in their colour. In this specimen, the crura of the stapes are disconnected from the base; I am unable to say whether this resulted from the process of absorption during life, or was produced by a mechanical lesion, previous or subsequent to death. The membrane of the fenestra rotunda appears in a natural state.

Left/ The right ear.—The meatus externus is dry, and deprived of cerumen.

The membrana tympani is thin and transparent.

The cavity of the tympanum.—The fibro-mucous

membrane is healthy ; the nervous plexus is most distinctly seen, and there are no membranous bands between any part of it. The stapes is entire, and is completely and firmly ankylosed to the circumference of the fenestra ovalis.*

The following is a concise view of the state of the cavity of the tympanum in the 41 dissections of which the particulars have been detailed at length above.

1	In a healthy state	10
2	With simple thickening of the investing membrane	6
3	With membranous bands proceeding from various parts of the cavity of the tympanum, most frequently connecting the stapes to the circumference of that cavity	4
4	With slight thickening of the investing membrane, accompanied by the existence of membranous connecting bands . . .	13
5	With considerable thickening of the investing membrane and with membranous bands	5
6	With suppuration of the cavity of the tympanum	1
7	With ankylosis of the base of the stapes to the circumference of the fenestra ovalis .	2

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* I defer to a future opportunity the particulars of the case of the patient from whom the specimens were taken.

Upon these dissections, I shall at the present time offer only a few words of observation.

It must appear remarkable that, in thirty-nine specimens of the organ of hearing, taken promiscuously, there should be so large a majority which present appearances indicative of disease. I must observe however, that in several dissections, and more particularly those in which there exist delicate membranous bands, connecting together various portions of the mucous membrane, without the latter being thickened, the deviation from the healthy state is so very slight, that it may be presumed there was not any accompanying derangement of the functions of the organ. The large proportion of specimens which are undoubtedly in a diseased state is very surprising, but it may be less so perhaps when I state that many persons whom I have examined, and who have considered that they *hear perfectly well*, cannot distinguish the ticking of my watch at a distance of two feet and a half, and in some cases, of four or five inches only ; though the same watch can be heard distinctly by a healthy ear seven or eight feet from the head. I am thus induced to believe that the function of the ear is impaired much more frequently than is generally supposed ; but that such impaired function is not detected without special inquiry. It would be interesting to know whether such derangements are dependent upon the peculiar conditions of the investing membrane of the tympanic cavity, which I have had occasion so frequently to notice in my relation of the above dissections.

In conclusion, I trust that this communication will be regarded only as the commencement of my researches into the pathological conditions of the cavity of the tympanum, and I hope that the appearance of incompleteness by which it is characterized will be overlooked, when it is remembered that the path which I am pursuing has hitherto been untrodden, and that many difficulties which beset it have still to be removed.

I beg to state, that all the preparations from which the above descriptions were written are in my possession ; and that I shall have great pleasure in showing them to any members of the profession, to whom, I take this opportunity of stating, I shall feel deeply indebted for any opportunities that they may kindly afford me, of dissecting the organ of hearing, especially when it is diseased.

12, Argyll Place, April 1841.

Note.—Since the above Paper was read, my attention has been directed to a paper published in the 110th volume of the Philosophical Transactions, entitled, “ On Sounds inaudible by certain Ears, by William Hyde Wollaston, M.D., F.R.S.” The object of the author is to show that there is a very distinct and striking difference between the powers of hearing of different individuals. I am inclined to believe that the deficiency of the power depends upon

some pathological condition of the ear, perhaps of a nature similar to that which I have pointed out. Dr. Wollaston states that it never occurred to him to find this defect in any person under twenty years of age—a fact which favours the opinion of its being dependent upon disease or derangement of the organ.